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USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK, VOLUME 107. MA-8 AIR--ETC(U)  
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AMRL-TR-75-50-VOL-107

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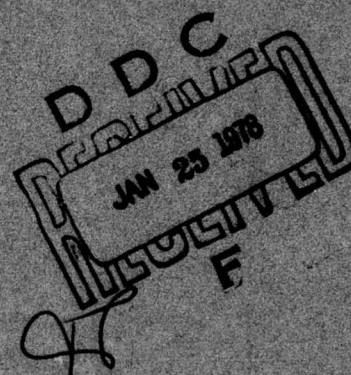
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**USAF BIOENVIRONMENTAL NOISE DATA  
HANDBOOK**

Volume 107.

MA-8 Air Conditioner.



Technical rept.,

Nick A. / Farinacci

DEC 76

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AEROSPACE MEDICAL RESEARCH LABORATORY  
AEROSPACE MEDICAL DIVISION  
AIR FORCE SYSTEMS COMMAND  
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

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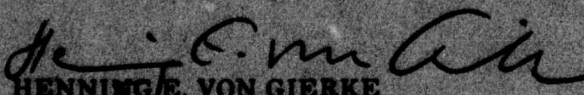
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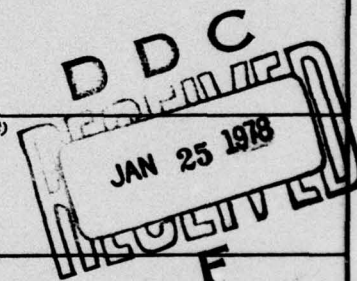
This technical report has been reviewed and is approved for publication.

**FOR THE COMMANDER**

  
HENNING E. VON GIERKE  
Director  
Biodynamics and Bionics Division  
Aerospace Medical Research Laboratory

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The MA-8 Air Conditioner is an electric motor driven air conditioner designed to cool electronic equipment on aircraft during ground maintenance. This report provides measured data defining the bioacoustic environments produced by this unit operating inside a large aircraft hangar at normal rated conditions. Near-field data are reported for 37 locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference		





level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Refer to Volume 1 of this handbook, USAF Bioenvironmental Noise Data Handbook, Vol 1: Organization, Content and Application, AMRL-TR-75-50(1) 1975, for discussion of the objective and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc.

## PREFACE

This report was prepared by the Biodynamic Environment Branch, Aerospace Medical Research Laboratory, under Project/Task 723104, Measurement and Prediction of Noise Environments of Air Force Operations.

The author acknowledges the efforts of Mr. Robert T. England and Mr. Robert G. Powell who conducted the field measurements, and Mr. John N. Cole who established the data analysis requirements and assisted in the preparation of this report. Mr. Henry Mohlman and Mr. David Eilerman of the University of Dayton assisted in the mechanics of data processing, and Mrs. Norma Peachey typed and prepared the graphics.

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#### NEAR-FIELD NOISE

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## INTRODUCTION

The MA-8 Air Conditioner is an electric motor-driven air conditioner designed to cool electronic equipment on aircraft during ground maintenance.

This volume provides measured data defining the bioacoustic environments produced by this unit. Such data are essential to evaluate ear protection requirements, limiting personnel exposure times, voice communication capabilities, and annoyance problems associated with operations of the MA-8 air conditioner.

This volume is one of a series published by the Aerospace Medical Research Laboratory (AMRL) under the same report number (AMRL-TR-75-50) as a multi-volume handbook that quantifies the noise environments produced at flight/ground crew locations and in surrounding communities by operations of Air Force aircraft and ground support equipment. The far-field, community-type, noise data in the handbook describe the noise produced during *ground operations* of aircraft, ground support equipment, and other ground-based equipment or facilities.

Volume 1 of this handbook discusses the objectives and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc. Volume 2 provides a method and data for adjusting the handbook's far-field noise data, which are for standard meteorological conditions (15C temperature, 70% rel humidity, 0.760 meters Hg barometric pressure) to derive comparable data for other meteorological conditions. *Refer to Volumes 1 and 2* (references 1 and 2) for such information because it is not repeated in other handbook volumes.

A cumulative index lists those aerospace systems contained in the handbook, and identifies the specific volumes containing each type of environmental noise data available (i.e., inflight/flight crew and passenger noise, near-field/ground crew noise, far-field/community noise). Volume numbers are assigned sequentially as individual volumes are published. This index is periodically updated as individual volumes are published, and is available upon request from AMRL/BBE, Wright-Patterson AFB, OH 45433. Organizations on the distribution list for the handbook will automatically receive a copy of the updated index as it is generated.

Direct any questions concerning the technical data in this report and other handbook volumes to: AMRL/BBE, Wright-Patterson AFB, OH 45433; Autovon 78-53675 or 78-53664; Commercial (513) 255-3675 or (513) 255-3664.

1. Cole, John N., *USAF Bioenvironmental Noise Data Handbook, Volume 1: Organization, Content and Application*, AMRL-TR-75-50 (1), Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio, 1975.

2. Cole, John N., *USAF Bioenvironmental Noise Data Handbook, Volume 2: Procedure to Evaluate Effects of Non-standard Meteorological Conditions on Far-Field Noise*, AMRL-TR-75-50 (2), AMRL, WPAFB, OH, 1975.



## NEAR-FIELD NOISE

### MEASUREMENTS

A standard MA-8 Air Conditioner was operated inside, and approximately in the center of a large aircraft hanger (190.5 m long  $\times$  95.1 m wide  $\times$  18.3 m high) on a concrete floor at normal rated conditions. The hanger walls and ceiling were not acoustically treated. No aircraft were in the vicinity of the unit while being measured. No far-field acoustic data were acquired because of the relatively close proximity of the hanger walls.

Figure 1 identifies 36 noise measurement locations at a height of 1.5 meters above the concrete apron (nominal ear level of ground crew). The 0 degree reference direction passes through the tow bar. These locations are in the acoustic near-field of the source where the sound wave fronts generally do not spherically diverge and the source appears to be spatially distributed (i.e., not a point source). Consequently, these near-field data cannot be extrapolated to longer distances but do properly define the levels at locations close to the unit.

Near-field measurements were also made at ear level at the operator control panel. Table 1 lists the numeric/alphabetic designators used on the data pages in this report to identify the operator measurement location and test conditions. The designator 1/A means operator location 1 and test condition A. Such a descriptor is essential in many handbook volumes that involve multiple combinations of locations/conditions. It is used in this report to maintain format consistency.

### RESULTS

The measured data presented in Table 2 define the sound pressure levels (SPL) produced by the MA-8 unit at the 37 specified, near-field locations. This table includes the overall, 1/3 octave band, and octave band levels. From these data one can calculate the variety of measures in Table 3 which are widely used to assess the effects of noise on personnel and their performance.

For data at other intermediate near-field locations (i.e., for radial distances less than 4 meters) you can interpolate between the 36 measured data points.

TABLE 1  
MEASUREMENT LOCATION AND TEST CONDITION  
FOR OPERATOR NOISE MEASUREMENTS

MA-8 Air Conditioner, Edwards AFB, 22 Sep 1972

#### Measurement Location

1

Operator Control Panel

#### Operation

A

Vent Cycle

B

Cooling Cycle

C

Heat Cycle

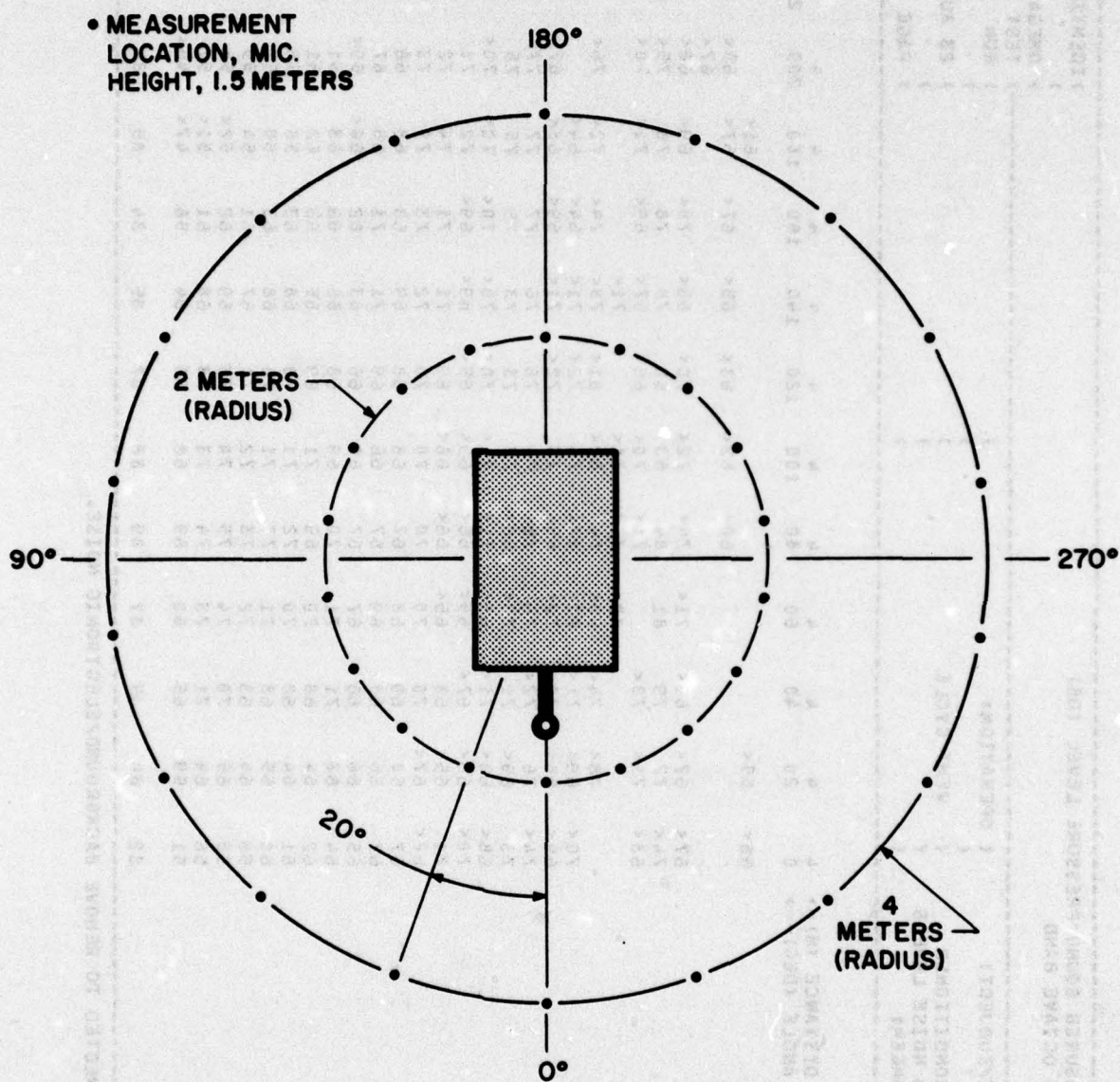


Figure 1. Measurement Locations



TABLE: MEASURED SOUND PRESSURE LEVEL (dB)										IDENTIFICATION:									
1/3 OCTAVE BAND																			
NOISE SOURCE/SUBJECT: ( OPERATION: )																			
MA-8 AIR CONDITIONER ( VENT CYCLE )																			
NEAR FIELD NOISE LEVELS ( INSIDE HANGER )																			
FREQ (HZ)	DISTANCE (M) ->	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
ANGLE (DEG) -->	0	20	40	60	80	100	120	140	160	180	200	220	240						
25	66<	65<												61<					
31.5																			
40														61<					
50														67<					
63	67<	67<	69<	71<	71<	74<	72<	70<	70<	70<	68<	67<	67<	67<					
80	74<	77	79	81	84	83	80	78	78	78	75<	75<	76<	76<					
100	68<	71<	70<	72<	75<	71<	70<	66<	69<	71<	70<	70<	70<	70<					
125		78<	74<	80<	84	82<	81<	78<	74<	72<	72<	72<	72<	72<					
160	70<	69<	71<	72<	67<	74	72<	71<	64<	64<	64<	64<	64<	64<					
200	69<	68<	70<	72<	72<	69<	73	72<	69<	68<	68<	67<	67<	67<					
250	74<	76	72<	76	76	76	76	76	77	77	77	77	77	77					
315	73	69<	71	70<	68<	73	73	73	75	75	75	75	75	75					
400	68<	69<	71<	68<	71<	71<	70<	70<	70<	70<	70<	70<	70<	70<					
500	70<	66<	67<	65<	66<	65<	65<	69<	69<	72	71	71	71	71					
630	71	65<	68	65<	66<	66<	69	71	71	74	72	72	72	72					
800	68<	67<	70	70	70	70	70	72	73	75	73	73	73	73					
1000	67	68	69	68	67	68	68	69	68	68	68	68	68	68					
1250	67	66	68	69	67	66	69	71	71	71	68	67	67	67					
1600	65	66	66	67	67	66	66	63	62	60<	59<	59<	59<	59<					
2000	64	68	71	71	70	69	68	66	66	63	61	60	60	60					
2500	62	64	68	70	69	71	69	65	63	62	61	59	58	58					
3150	61	64	68	70	72	71	70	68	63	58	58	57	56	56					
4000	60	65	68	71	73	71	70	68	63	58	57	58	54<	54<					
5000	58	64	68	72	73	72	71	67	61	54	55	55	52<	52<					
6300	55	65	70	74	75	74	73	69	62	52<	56	54	53<	53<					
8000	56	64	71	73	74	73	73	68	61	51<	52	52	52	52					
10000	51	59	65	68	69	68	68	64	56	47<	46<	50	49	49					
OVERALL	82	84	85	87	89	88	87	85	84	85	84	82	85						

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB) 1/3 OCTAVE BAND										IDENTIFICATION:									
2										OMEGA 3-2 TEST 71-020-320 RUN 02 23 AUG 74 PAGE F2									
NOISE SOURCE/SUBJECT: ( OPERATION: )																			
MA-8 AIR CONDITIONER NEAR FIELD NOISE LEVELS (INSIDE HANGER)																			
FREQ (HZ)	DISTANCE (M) -->	4	4	4	4	4	4	4	4	2	2	2	2	2	2	2	2	2	2
ANGLE (DEG) -->	260	260	280	300	320	340	0	20	40	60	80	100	120	140					
25																			
31.5																			
40	60<																		
50	68<	70<	72<	72<	71<	66<	72<	73<	76	78	78	77	75<	64<					
63	80	82	83	83	82	76<	83	85	88	89	90	88	85	70<					
80	71<	67<	72<	72<	69<	67<	68<	71<	70<	74<	71<	71<	67<	71<					
100																			
125	78<	77<	79<	79<			79<	78<	81<	84	86	85	84	83					
160	73<	75	75	75	69<	73<	82	76	74	77	81	82	83	82					
200	71<	73	74	74	69<	72<	80	73	75	79	81	81	82	81					
250	69<	72<	73<	73<	71<	70<	73<	77	77	80	77	79	80	77					
315	69<	72	65<	67<	66<	70<	75	73	73	75	75	74	73	73					
400	69<	67<	63<	63<	63<	66<	76	74	73	75	76	76	75	76					
500	64<	62<	63<	63<	63<	66<	72	72	70<	69	69	70<	70<	73					
630	64<	63<	63<	63<	67	70	72	69	72	72	73	72	72	78					
800	64<	63<	63<	63<	68<	69	71	70	72	72	73	75	73	78					
1000	62<	62<	62<	62<	64<	67	70	71	74	73	72	72	71	72					
1250	60<	60<	63	63	66	67	70	67	69	73	73	72	71	73					
1600	57<	58<	58<	58<	63	65	68	68	71	72	73	73	71	69					
2000	57<	58<	58<	61	64	65	70	68	72	77	75	75	70	69					
2500	56	57	57	57	60	62	66	65	69	73	74	75	71	68					
3150	56	56	57	57	61	61	66	65	70	75	78	77	74	70					
4000	56	54<	56	56	60	61	66	65	71	77	79	78	76	70					
5000	52<	52<	54	54	57	58	62	63	71	78	79	79	76	70					
6300	51<	51<	52<	52<	54	54	58	63	73	80	81	80	77	71					
8000	50<	49<	50<	50<	52	55	60	62	73	81	81	80	77	70					
10000	47<	45<	47<	47<	51	53	57	57	67	76	76	75	71	65					
OVERALL	84	85	86	84	84	82	89	88	90	93	94	93	92	90					

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.



TABLE: MEASURED SOUND PRESSURE LEVEL (DB)													IDENTIFICATION:								
1/3 OCTAVE BAND																					
NOISE SOURCE/SUBJECT: ( OPERATION: )													OMEGA 3.2								
MA-8 AIR CONDITIONER ( VENT CYCLE )													TEST 71-020-320								
NEAR FIELD NOISE LEVELS ( )													RUN 03								
( INSIDE HANGER) ( )													23 AUG 74								
													PAGE F3								
FREQ (HZ)	DISTANCE (M)-->	2	160	180	2	200	220	2	240	2	260	2	280	2	300	2	320	2	340	2	OPERATOR LOCATION TEST CONDITION 1/A
25		68<	68<	66<	67<	67<	67<	65<	61<										62<		64<
31.5		72	73	71	66<	66<	66<														
40		72<	73<	74<	66<	66<	68<	71<	72<	74<	72<	70<									68<
50		74<	75<	71<	67<	68<	75<	82	84	85	82	79									76<
63		81	81	79	71<	75<	71<	68<	66<	67<	71<	69<									67<
80		73<	75<	72<	75<	71<	68<	66<	67<	71<	73<	73<									74<
100		74<	74<																		81<
125		83<	81<	80<	78<	78<	78<	76<	76<												74
160		78	75	76	75	77	74	78	81	83	79	84									74
200		79	74	76	74	75	72<	72<	74<	81	78	82									74
250		79	75<	76	72<	72<	70<	69<	70<	69<	71	73									74
315		77	76	76	75	70<	77	70<	69<	69<	70<	76									74
400		76	78	77	78	78	70<	71<	69<	68<	69<	72									73
500		76	78	76	74	69<	67<	67<	68<	67	72	74									69
630		81	80	82	75	66<	66<	66<	68	66<	71	73									68<
800		82	81	81	76	67<	64<	67<	65<	65<	68	70									69
1000		75	74	72	70	66	66	64<	65<	65<	69	72									68<
1250		78	71	67	67	66	66	64	65	63<	69	72									68
1600		66	63	63	65	63	62	62	63	62	65	70									67
2000		69	66	62	64	62	64	62	63	60	65	70									65
2500		67	67	63	63	61	62	61	60	60	61	67									65
3150		64	62	60	61	62	61	61	60	60	61	67									66
4000		65	61	59	62	60	60	60	59	59	61	67									65
5000		62	57	58	61	60	58	58	57	56	59	64									62
6300		60	55	57	59	59	57	57	56	56	59	59									63
8000		59	54	54	57	56	55	55	55	55	56	59									61
10000		55	51	52	56	52	52	52	53	50	53	58									59
OVERALL		91	89	89	86	84	87	89	89	89	87	89									86

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)										IDENTIFICATION:									
2 1/3 OCTAVE BAND																			
NOISE SOURCE/SUBJECT: ( OPERATION: )																			
MA-8 AIR CONDITIONER																			
NEAR FIELD NOISE LEVELS																			
(INSIDE HANGER)																			
FREQ (HZ)	DISTANCE (M)-->	4	20	40	60	80	100	120	140	160	180	200	220	240					
ANGLE (DEG)-->	0	61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
25		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
31.5		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
40		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
50		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
63		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
80		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
100		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
125		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
160		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
200		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
250		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
315		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
400		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
500		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
630		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
800		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
1000		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
1250		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
1600		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
2000		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
3150		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
4000		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
5000		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
6300		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
8000		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
10000		61<	65<	69<	76<	87<	81<	83<	87<	81<	83<	87<	81<	83<					
OVERALL		95	94	93	90	91	90	89	88	86	86	91	92	91					

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.



TABLE: MEASURED SOUND PRESSURE LEVEL (DB)														IDENTIFICATION:			
2 1/3 OCTAVE BAND																	
NOISE SOURCE/SUBJECT: ( OPERATION: )														OMEGA 3.2			
MA-8 AIR CONDITIONER ( COOLING CYCLE )														TEST 71-020-320			
NEAR FIELD NOISE LEVELS ( ( ) )														RUN 05			
(INSIDE HANGER) ( )														23 AUG 74			
( )														PAGE F5			

[illegible]

&lt; LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.



TABLE: MEASURED SOUND PRESSURE LEVEL (DB)		IDENTIFICATION:													
2		OMEGA 3.2													
		TEST 71-020-320													
NOISE SOURCE/SUBJECT:		RUN 07													
MA-8 AIR CONDITIONER															
NEAR FIELD NOISE LEVELS		23 AUG 74													
(INSIDE HANGER)		PAGE F7													
FREQ (HZ)	DISTANCE (M)--> ANGLE (DEG)-->	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		0	20	40	60	80	100	120	140	160	180	200	220	240	
25															
31.5															
40															
50															
63															
80															
100															
125															
160															
200															
250															
315															
400															
500															
630															
800															
1000															
1250															
1600															
2000															
2500															
3150															
4000															
5000															
6300															
8000															
10000															
OVERALL		83	85	85	86	86	86	84	84	82	82	83	85	84	

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)																
1/3 OCTAVE BAND																
2																
NOISE SOURCE/SUBJECT: ( OPERATION: )																
MA-8 AIR CONDITIONER ( HEAT CYCLE )																
NEAR FIELD NOISE LEVELS ( )																
( INSIDE HANGER ) ( )																
IDENTIFICATION: )																
OMEGA 3.2																
TEST 71-020-320																
RUN 08																
23 AUG 74																
PAGE F8																
FREQ (HZ)	DISTANCE (M)-->	4	260	280	300	320	340	4	2	20	40	60	80	100	120	140
25																
31.5																
40																
50																
63																
80																
100																
125																
160																
200																
250																
315																
400																
500																
630																
800																
1000																
1250																
1600																
2000																
2500																
3150																
4000																
5000																
6300																
8000																
10000																
OVERALL																
< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.																

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.



TABLE: MEASURED SOUND PRESSURE LEVEL (DB)													
2 1/3 OCTAVE BAND													
NOISE SOURCE/SUBJECT: ( OPERATION: )													
HA-8 AIR CONDITIONER ( HEAT CYCLE )													
NEAR FIELD NOISE LEVELS ( INSIDE HANGER )													
IDENTIFICATION: ) OMEGA 3.2 ) TEST 71-020-320 ) RUN 09 ) 23 AUG 74 ) PAGE F9 )													
FREQ (HZ)	DISTANCE (M) -->	2	2	2	2	2	2	2	2	2	2	2	2
ANGLE (DEG) -->	160	180	200	220	240	260	280	300	320	340	360	TEST CONDITION	1/C
25	71<	69<	69<	64<	74<	75<	75<	75<	61<	65<	62<		
31.5	69<	66<	67<	72<	83	84	84	84	72<	72<	73<		
40	69<	70<	78	81	83	84	84	84	81	82	82		
50	77<	73<	75<	71<	69<	69<	72<	74<	70<	69<	75<		
63	75<	76<	82<	72<	79<	77<	77<	82<	87	87	83		
80	76<	76	77	73<	74	74	76	78	81	77	75		
100	82<	77	77	72<	73<	74<	75<	77	76	76	74		
125	76	76	76	74	72	73	74	73	74	73	75		
160	77	76	77	74	70<	69<	72	72	73	73	74		
200	77	76	77	74	69<	73	73	72	73	73	72		
315	76	77	77	74	71	72	76	76	75	74	70		
400	76	77	77	74	69<	73	73	72	73	73	72		
500	77	77	77	74	71	72	76	76	75	74	71		
630	84	82	74	72	69	71	73	71	71	72	71		
800	83	82	74	72	68	72	73	71	71	70	69		
1000	76	77	77	71	68	72	73	71	71	70	68		
1250	77	77	77	69	67	72	73	71	71	70	68		
1600	67	67	64	66	66	70	73	72	70	68	67		
2000	69	64	61	65	66	70	73	72	70	68	67		
2500	67	64	61	62	64	68	69	68	66	63	63		
3150	64	59	58	62	59	65	67	64	62	59	61		
4000	63	60	55	61	58	64	66	63	61	58	57		
5000	60	58	53	57	56	62	64	60	58	57	58		
6300	58	55	51	52	51	59	61	60	58	57	58		
8000	55	53	51	52	51	59	61	60	58	57	58		
10000	53	51	51	52	51	59	61	60	58	57	58		
OVERALL	90	89	89	88	87	88	89	90	90	90	88		

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

[illegible]



TABLE: MEASURED SOUND PRESSURE LEVEL (DB)		IDENTIFICATION:									
2	OCTAVE BAND										
NOISE SOURCE/SUBJECT:		OPERATION:									
MA-8 AIR CONDITIONER		VENT CYCLE									
NEAR FIELD NOISE LEVELS											
(INSIDE HANGER)											
		PAGE J2									
FREQ (HZ)	DISTANCE (M) ->	4	4	4	4	4	4	4	4	4	4
	ANGLE (DEG) -->	260	260	260	260	260	260	260	260	260	260
31.5		80	82	84	83	77	84	85	69	65	73
63		79	80	80	74	75	84	80	90	88	82
125		75	77	77	74	75	81	79	87	87	86
250		71	69	70	71	73	78	77	83	83	83
500		67	66	68	71	72	75	74	77	78	81
1000		62	62	64	67	69	73	72	79	79	80
2000		60	59	60	64	65	70	69	81	83	75
4000		55	54	55	57	59	63	66	84	83	74
8000		84	85	86	84	81	89	88	93	93	90
OVERALL											





TABLE:	MEASURED SOUND PRESSURE LEVEL (DB)	IDENTIFICATION:
2	OCTAVE BAND	OMEGA 3.2
		TEST 71-020-320
		RUN 04
		23 AUG 74
		PAGE J4
NOISE SOURCE/SUBJECT:	OPERATION:	
MA-8 AIR CONDITIONER	COOLING CYCLE	
NEAR FIELD NOISE LEVELS		
(INSIDE MANGER)		
FREQ (HZ)	DISTANCE (M)-->	ANGLE (DEG)-->
31.5	67	78
63	78	81
125	82	85
250	89	89
500	89	87
1000	90	88
2000	85	84
4000	77	76
8000	64	69
OVERALL	95	94
	93	90
	91	89
	88	86
	86	83
	82	80
	79	77
	76	74
	72	70
	69	67
	65	63
	62	60
	59	57
	56	54
	53	51
	50	48
	47	45
	44	42
	41	39
	38	36
	35	33
	32	30
	29	27
	26	24
	23	21
	20	18
	17	15
	14	12
	11	9
	8	6
	5	3
	2	0

[illegible]



TABLE: MEASURED SOUND PRESSURE LEVEL (DB)		IDENTIFICATION:									
2		OCTAVE BAND									
NOISE SOURCE/SUBJECT:		OPERATION:									
MA-8 AIR CONDITIONER		COOLING CYCLE									
NEAR FIELD NOISE LEVELS											
(INSIDE HANGER)											
DISTANCE (M) -->		2	2	2	2	2	2	2	2	2	2
ANGLE (DEG) -->		160	180	200	220	240	260	280	300	320	340
FREQ (HZ)		TEST CONDITION 1/8									
31.5	77	77	74	77	74	73	71	93	93	88	69
63	83	85	84	85	84	90	93	86	85	86	86
125	86	83	83	84	85	84	85	81	84	87	89
250	87	85	85	85	83	83	83	83	86	88	91
500	86	87	84	84	81	83	81	82	82	87	93
1000	82	83	82	79	76	76	76	77	77	87	92
2000	75	75	78	74	72	72	72	73	73	81	89
4000	70	69	74	68	67	68	68	68	68	72	81
8000	64	62	69	63	60	61	61	61	61	62	69
OVERALL	92	92	91	93	94	94	94	94	94	95	98
											90

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)													
2													
NOISE SOURCE/SUBJECT: ( OPERATION: )													
MA-8 AIR CONDITIONER ( HEAT CYCLE )													
NEAR FIELD NOISE LEVELS ( INSIDE HANGER )													
IDENTIFICATION: )													
OMEGA 3.2													
TEST 71-020-320													
RUN 07													
23 AUG 74													
PAGE J7													
FREQ (HZ)	DISTANCE (M)-->	4	4	4	4	4	4	4	4	4	4	4	4
ANGLE (DEG)-->	0	0	0	0	0	0	0	0	0	0	0	0	0
31.5													
63													
125	80	77	81	82	82	79	79	74	74	76	79	82	83
250	77	75	77	78	78	81	81	79	79	76	76	76	75
500	71	71	72	73	73	73	73	74	74	75	76	77	75
1000	72	72	73	74	74	73	73	74	74	75	75	76	73
2000	68	72	74	75	75	76	76	73	70	68	65	67	68
4000	64	68	73	75	77	77	72	75	66	59	61	62	64
8000	57	65	71	73	74	74	69	73	53	56	56	56	59
OVERALL	83	85	85	85	86	86	83	84	82	82	83	85	84



TABLE: MEASURED SOUND PRESSURE LEVEL (DB)		IDENTIFICATIONS											
2		OCTAVE BAND											
NOISE SOURCE/SUBJECT:		OPERATIONS											
HA-8 AIR CONDITIONER		HEAT CYCLE											
NEAR FIELD NOISE LEVELS		(INSIDE HANGER)											
		PAGE J8											
FREQ (HZ)	DISTANCE (M)-->	4	4	4	4	4	4	2	2	2	2	2	2
ANGLE (DEG)-->	260	280	300	320	340	0	20	40	60	80	100	120	140
31.5	82	83	82	79		77	82	87	90	88	85	79	69
63	75	74	73	75	77	90	89	84	84	87	87	86	76
125	74	73	73	75	76	82	83	83	86	87	86	85	85
250	71	71	72	71	72	77	77	76	78	80	81	80	82
500	72	73	73	73	72	77	76	80	80	80	80	79	82
1000	69	70	70	71	70	74	73	77	80	81	82	77	75
2000	66	67	67	68	66	70	69	75	81	83	83	80	75
4000	60	61	60	60	59	62	62	72	80	81	81	77	71
8000													
OVERALL	84	84	84	82	81	91	91	91	93	94	93	91	90

IDENTIFICATION: )  
)  
)

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) OMEGA 3.2
) TEST 71-020-320
) RUN 09
)
) 23 AUG 74
)
) PAGE J9
) -----
)
) OPERATOR LOCATION
) TEST CONDITION
) 1/C
)
) 83
) 84
) 79
) 77
) 75
) 73
) 70
) 65
)
) 88
)

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TABLE: MEASURES OF HUMAN NOISE EXPOSURE														IDENTIFICATION:	
3														OMEGA 3.2	
														TEST 71-020-320	
NOISE SOURCE/SUBJECT:														RUN 01	
( OPERATION: )															
( VENT CYCLE )														23 AUG 74	
( NEAR FIELD NOISE LEVELS )															
( INSIDE HANGER )														PAGE H1	
DISTANCE (M)--> 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4															
ANGLE (DEG)--> 0 20 40 60 80 100 120 140 160 180 200 220 240															
HAZARD/PROTECTION															
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR															
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR															
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)															
NO PROTECTION															
OASLC															
OASLA															
MINIMUM QPL EAR MUFFS															
OASLA*															
T															
AMERICAN OPTICAL 1700 EAR MUFFS															
OASLA*															
T															
V-51R EAR PLUGS															
OASLA*															
T															
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS															
OASLA*															
T															
H-133 GROUND COMMUNICATION UNIT															
OASLA*															
T															
COMMUNICATION															
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)															
PSIL															
ANNNOYANCE															
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNOB)															
TONE CORRECTION (C IN DB)															
PNLT															
C															
* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.															

TABLE: MEASURES OF HUMAN NOISE EXPOSURE															IDENTIFICATION:														
3															OMEGA 3.2														
															TEST 71-020-320														
NOISE SOURCE/SUBJECT: ( OPERATION: )															RUN 02														
H-A AIR CONDITIONER ( VENT CYCLE )															23 AUG 74														
NEAR FIELD NOISE LEVELS ( INSIDE HANGER )															PAGE M2														
DISTANCE (M)--> 4															2														
ANGLE (DEG)--> 260															4														
															2														
															2														
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TABLE: MEASURES OF HUMAN NOISE EXPOSURE										IDENTIFICATION:
NOISE SOURCE/SUBJECT: ( OPERATION: )										OMEGA 3.2
MA-8 AIR CONDITIONER ( VENT CYCLE )										TEST 71-020-320
NEAR FIELD NOISE LEVELS ( )										RUN 03
( INSIDE WANGER) ( )										23 AUG 74
										PAGE M3
DISTANCE (M)-->	2	2	2	2	2	2	2	2	2	2 OPERATOR LOCATION
ANGLE (DEG)-->	160	180	200	220	240	260	280	300	320	340 TEST CONDITION 1/A
HAZARD/PROTECTION										
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR										
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR										
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)										
NO PROTECTION										
OASLC	90	89	89	86	84	87	88	88	87	89
OASLA	86	85	85	81	77	77	78	77	79	82
T	339	404	404	807	960	960	960	960	960	679
MINIMUM QPL EAR MUFFS										
OASLA*	67	65	65	63	61	63	65	65	64	66
T	960	960	960	960	960	960	960	960	960	960
AMERICAN OPTICAL 1700 EAR MUFFS										
OASLA*	62	61	60	58	57	60	62	62	60	62
T	960	960	960	960	960	960	960	960	960	960
V-SIR EAR PLUGS										
OASLA*	63	62	62	58	53	55	56	55	56	58
T	960	960	960	960	960	960	960	960	960	960
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-SIR EAR PLUGS										
OASLA*	49	47	47	44	40	42	43	43	43	45
T	960	960	960	960	960	960	960	960	960	960
H-133 GROUND COMMUNICATION UNIT										
OASLA*	59	57	56	53	52	53	55	55	54	57
T	960	960	960	960	960	960	960	960	960	960
COMMUNICATION										
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)										
PSIL	80	79	78	75	71	70	70	69	73	76
ANNOUNCE										
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)										
TONE CORRECTION (C IN DB)										
PNLT	100	97	96	94	90	92	93	92	92	96
C	2	1	1	1	0	1	1	1	0	1
* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.										

TABLE: MEASURES OF HUMAN NOISE EXPOSURE															IDENTIFICATION:
3															
NOISE SOURCE/SUBJECT: ( OPERATIONS: )															
HA-8 AIR CONDITIONER ( COOLING CYCLE )															
NEAR FIELD NOISE LEVELS ( INSIDE HANGER )															
															OMEGA 3.2
															TEST 71-820-320
															RUN 04
															23 AUG 74
															PAGE M4
HAZARD/PROTECTION															
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR															
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR															
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)															
NO PROTECTION															
OASLC	95	94	92	90	90	90	89	87	86	85	91	91			
OASLA	93	91	89	85	84	84	83	82	81	81	87	87			
T	101	143	202	404	480	480	571	679	807	807	285	285			480
MINIMUM QPL EAR MUFFS															
OASLA*	70	70	68	65	65	66	65	64	62	62	67	67			66
T	960	960	960	960	960	960	960	960	960	960	960	960			960
AMERICAN OPTICAL 1700 EAR MUFFS															
OASLA*	65	65	64	62	63	62	61	60	58	57	63	63			63
T	960	960	960	960	960	960	960	960	960	960	960	960			960
V-51R EAR PLUGS															
OASLA*	69	67	65	61	60	59	58	58	57	58	64	64			61
T	960	960	960	960	960	960	960	960	960	960	960	960			960
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS															
OASLA*	54	53	51	47	47	46	45	44	43	43	49	50			48
T	960	960	960	960	960	960	960	960	960	960	960	960			960
H-133 GROUND COMMUNICATION UNIT															
OASLA*	65	64	62	59	58	58	57	55	54	53	58	59			58
T	960	960	960	960	960	960	960	960	960	960	960	960			960
COMMUNICATION															
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)															
PSIL	88	86	84	79	77	77	76	76	75	75	81	81			79
ANNOYANCE															
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)															
TONE CORRECTION (C IN DB)															
PNLT	105	104	102	100	100	99	98	96	94	93	99	100			98
C	1	1	1	1	1	1	1	1	1	1	1	1			2
* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.															



TABLE: MEASURES OF HUMAN NOISE EXPOSURE													IDENTIFICATION:
3													OMEGA 3.2
NOISE SOURCE/SUBJECT:													TEST 71-020-320
( OPERATIONS:													RUN 05
( COOLING CYCLE													23 AUG 74
( NEAR FIELD NOISE LEVELS													PAGE M5
( (INSIDE HANGER)													
HAZARD/PROTECTION													
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR													
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR													
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)													
NO PROTECTION													
OASLC	91	92	92	93	94	94	101	100	97	96	96	96	94
OASLA	81	81	85	89	92	92	99	97	92	91	92	93	90
T	807	807	404	202	120	120	36	50	120	143	120	101	170
MINIMUM QPL EAR MUFFS													
OASLA*	66	67	67	68	69	77	77	76	73	72	72	72	71
T	960	960	960	960	960	960	960	960	960	960	960	960	960
AMERICAN OPTICAL 1700 EAR MUFFS													
OASLA*	64	65	64	64	65	72	71	71	68	68	67	66	64
T	960	960	960	960	960	960	960	960	960	960	960	960	960
V-51R EAR PLUGS													
OASLA*	59	59	62	66	68	75	73	69	67	66	67	65	63
T	960	960	960	960	960	960	960	960	960	960	960	960	960
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS													
OASLA*	47	47	49	52	53	60	59	54	53	53	53	51	49
T	960	960	960	960	960	960	960	960	960	960	960	960	960
H-133 GROUND COMMUNICATION UNIT													
OASLA*	58	59	60	62	64	71	69	65	65	66	66	63	60
T	960	960	960	960	960	960	960	960	960	960	960	960	960
COMMUNICATION													
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)													
PSIL	76	76	80	84	87	94	92	86	85	85	86	83	81
ANNOYANCE													
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)													
TONE CORRECTION (C IN DB)													
PNLT	94	95	98	102	104	111	108	104	105	107	109	104	101
C	0	0	1	1	1	1	0	0	0	0	1	0	1

\* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.

\* BASED ON CALCULATED SPI SPECTRUM UNDER PROTECTIVE DEVICE.

TABLE: MEASURES OF HUMAN NOISE EXPOSURE													IDENTIFICATION:
3													
NOISE SOURCE/SUBJECT: ( OPERATION: )													OMEGA 3.2
MA-8 AIR CONDITIONER ( COOLING CYCLE )													TEST 71-020-320
WEAR FIELD NOISE LEVELS ( )													RUN 06
(INSIDE HANGER) ( )													23 AUG 74
( )													PAGE H6
HAZARD/PROTECTION													
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR													
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR													
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)													
NO PROTECTION													
OASLC	92	92	91	93	93	93	94	94	98	90			
OASLA	87	87	86	84	82	82	84	90	96	83			
T	285	285	339	480	679	679	480	170	60	571			
MINIMUM QPL EAR MUFFS													
OASLA*	69	68	67	68	69	68	69	70	74	67			
T	960	960	960	960	960	960	960	960	960	960			
AMERICAN OPTICAL 1700 EAR MUFFS													
OASLA*	64	63	63	65	66	66	67	66	69	63			
T	960	960	960	960	960	960	960	960	960	960			
V-51R EAR PLUGS													
OASLA*	64	64	63	62	60	60	62	67	72	60			
T	960	960	960	960	960	960	960	960	960	960			
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS													
OASLA*	50	50	49	49	49	48	49	53	57	47			
T	960	960	960	960	960	960	960	960	960	960			
H-133 GROUND COMMUNICATION UNIT													
OASLA*	60	59	59	59	60	60	60	63	68	57			
T	960	960	960	960	960	960	960	960	960	960			
COMMUNICATION													
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)													
PSIL	81	81	81	79	76	76	77	85	91	78			
ANNOYANCE													
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)													
TONE CORRECTION (C IN DB)													
PNLT	101	100	99	98	97	97	97	101	107	96			
C	2	1	0	1	1	1	0	0	0	1			

\* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.

\* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.



MEASURES OF HUMAN NOISE EXPOSURE														IDENTIFICATION:	
3														OMEGA 3.2	
														TEST 71-020-320	
														RUN 07	
														23 AUG 74	
														PAGE 47	
NOISE SOURCE/SUBJECT: ( OPERATION: )															
MA-8 AIR CONDITIONER ( HEAT CYCLE )															
NEAR FIELD NOISE LEVELS ( INSIDE HANGER )															
DISTANCE (M)--> 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4															
ANGLE (DEG)--> 0 20 40 60 80 100 120 140 160 180 200 220 240															
HAZARD/PROTECTION															
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR															
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR															
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)															
NO PROTECTION															
OASLC 83 85 84 85 86 86 84 83 82 81 83 85 84															
OASLA 76 78 80 81 82 82 81 79 79 77 78 79 77															
T 960 960 960 807 679 679 807 960 960 960 960 960 960															
MINIMUM QPL EAR MUFFS															
OASLA* 60 62 60 60 62 63 60 60 57 57 58 60 59															
T 960 960 960 960 960 960 960 960 960 960 960 960 960															
AMERICAN OPTICAL 1700 EAR MUFFS															
OASLA* 55 58 56 57 58 58 56 55 53 53 54 57 56															
T 960 960 960 960 960 960 960 960 960 960 960 960 960															
V-51R EAR PLUGS															
OASLA* 53 53 54 55 56 55 55 55 54 54 55 56 54															
T 960 960 960 960 960 960 960 960 960 960 960 960 960															
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS															
OASLA* 39 41 41 42 43 43 41 41 40 41 42 42 41															
T 960 960 960 960 960 960 960 960 960 960 960 960 960															
H-133 GROUND COMMUNICATION UNIT															
OASLA* 51 53 54 55 56 56 54 53 51 49 51 52 52															
T 960 960 960 960 960 960 960 960 960 960 960 960 960															
COMMUNICATION															
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)															
PSIL 70 72 73 74 74 74 73 73 73 71 72 73 72															
ANNOYANCE															
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)															
TONE CORRECTION (C IN DB)															
PNLT 92 93 98 99 100 98 99 94 93 88 90 92 91															
C 3 1 3 3 3 1 3 1 3 1 1 2 2															
* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.															

TABLE: MEASURES OF HUMAN NOISE EXPOSURE															IDENTIFICATIONS:
3															
NOISE SOURCE/SUBJECT:															
( OPERATION: )															
( HEAT CYCLE )															
( NEAR FIELD NOISE LEVELS )															
( ( INSIDE HANGER) )															
															OMEGA 3.2
															TEST 71-020-320
															RUN 08
															23 AUG 74
															PAGE H8
HAZARD/PROTECTION															
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR															
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR															
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)															
NO PROTECTION															
OASLC	84	84	83	82	82	91	91	90	93	93	93	90	89		
OASLA	76	77	77	78	77	82	82	84	88	89	89	86	86		
T	960	960	960	960	960	679	679	480	240	202	202	339	339		
MINIMUM QPL EAR MUFFS															
OASLA*	60	59	58	58	58	69	69	67	68	70	69	68	66		
T	960	960	960	960	960	960	960	960	960	960	960	960	960		
AMERICAN OPTICAL 1700 EAR MUFFS															
OASLA*	57	57	56	54	54	64	64	63	65	66	65	63	61		
T	960	960	960	960	960	960	960	960	960	960	960	960	960		
V-51R EAR PLUGS															
OASLA*	52	53	53	53	53	59	58	59	61	62	62	61	62		
T	960	960	960	960	960	960	960	960	960	960	960	960	960		
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS															
OASLA*	40	40	40	39	39	47	46	47	49	50	49	47	48		
T	960	960	960	960	960	960	960	960	960	960	960	960	960		
H-133 GROUND COMMUNICATION UNIT															
OASLA*	52	52	52	51	51	59	58	59	61	62	62	60	58		
T	960	960	960	960	960	960	960	960	960	960	960	960	960		
COMMUNICATION															
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)															
PSIL	71	71	72	72	72	76	75	78	79	80	81	79	80		
ANNOUNCE															
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)															
TONE CORRECTION (C IN DB)															
PNLT	91	91	90	90	93	98	97	100	103	105	105	102	99		
C	1	1	0	0	3	1	1	1	1	1	1	1	1		

\* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.

\* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.



